

WHAT IS CLAIMED IS:

1. A process of preparing a metal oxide film comprising:
 - applying a solution containing a metal precursor and a soluble polymer onto a substrate to form a polymer and metal containing layer thereon, said polymer characterized as having binding properties for said metal precursor; and,
 - heating said substrate in an oxygen-containing atmosphere at temperatures characterized as sufficient to remove said polymer from said polymer and metal containing layer and form a metal oxide film.
2. The process of claim 1 wherein said metal is selected from the group consisting of alkali metals, alkaline earth metals, main group metals, transition metals, and lanthanide metals.
3. The process of claim 1 wherein said metal is selected from the group consisting of main group metals.
4. The process of claim 1 wherein said metal is selected from the group consisting of transition metals.
5. The process of claim 1 wherein said metal is selected from the group consisting of lanthanide metals.
6. The process of claim 1 wherein said metal is selected from the group consisting of alkaline earth metals.
7. The process of claim 1 wherein said metal oxide film is characterized as epitaxial.
8. The process of claim 2 wherein said metal oxide film includes at least two of said metals.
9. The process of claim 1 wherein said metal oxide film is epitaxial europium oxide and said substrate is selected from the group consisting of lanthanum aluminum oxide, strontium titanate and lanthanum strontium aluminum tantalate.
10. The process of claim 1 wherein said solution includes a solvent selected from the group consisting of water, lower alcohols, acetone, tetrahydrofuran, polypropylene carbonate, acetonitrile, ethylacetate, acetic acid, and mixtures thereof.
11. The process of claim 10 wherein said solvent is water and is organic-solvent free.

12. The process of claim 10 wherein said solution further includes a metal-binding ligand or salts thereof.
13. The process of claim 12 wherein said solution further includes EDTA or salts thereof.
14. The process of claim 1 wherein said metal oxide film is zinc oxide and said substrate is c-cut sapphire.
15. The process of claim 1 wherein said metal oxide film is titanium oxide and said substrate is r-cut sapphire.
16. The process of claim 14 wherein said titanium oxide is of a rutile form.
17. The process of claim 1 said metal oxide film is titanium oxide and said substrate is lanthanum aluminum oxide.
18. The process of claim 15 wherein said titanium oxide is of an anatase form.
19. The process of claim 1 wherein said metal oxide film is a yttrium barium copper oxide film.
20. The process of claim 11 wherein said metal oxide film is a yttrium barium copper oxide film.
21. The process of claim 19 wherein said yttrium barium copper oxide film is epitaxial and is a high temperature superconductor.
22. The process of claim 20 wherein said yttrium barium copper oxide film is epitaxial and is a high temperature superconductor.
23. The process of claim 1 wherein said soluble polymer is selected from the group consisting of polyethylenimine, carboxylated polyethylenimine, polyacrylic acid, polypyridone, and poly(ethylene-maleic acid).
24. The process of claim 1 wherein said soluble polymer is polyethylenimine.
25. The process of claim 1 said metal oxide film is barium titanium oxide.
26. The process of claim 1 said metal oxide film is strontium titanium oxide.
27. The process of claim 1 wherein said solution is applied by a process selected from the group consisting of spin coating, dipping, spraying and ink jetting onto said substrate.
28. A composition of matter comprising a solution of at least two metal precursors and a soluble polymer, said polymer characterized as having binding

properties for said at least two metal precursors, wherein said at least two metal precursors are present in a pre-selected ratio.

29. The composition of matter of claim 28 wherein said composition is a solution of said at least two metal precursors and a soluble polymer.

30. The composition of claim 28 wherein said soluble polymer is selected from the group consisting of polyethylenimine, carboxylated polyethylenimine, polyacrylic acid, polypyrolidone, and poly(ethylene-maleic acid).

31. The composition of claim 29 wherein said solution includes a solvent selected from the group consisting of water, lower alcohols, acetone, tetrahydrofuran, polypropylene carbonate, acetonitrile, ethylacetate, acetic acid, and mixtures thereof.

32. The composition of claim 29 wherein said solvent is water and is organic-solvent free.